SIO-R-310

Serial (RS485) Relay I/O

User Manual

Version 1.1

Infosystem Technology Corporation, Ltd.

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Product Information

A. Introduction

SIO is an I/O controller product with Serial Port on its data communication and makes data acquisition easier through ModBus Protocol of RTU/ASCII mode on Serial Bus. For different conditions, SIO basically has been design into four models. SIO-R is Relay type I/O Controller. SIO-A is Analog I/O. SIO-D is Digital I/O. And SIO-T is Temperature I/O Controller. By using these products, the controlling and monitoring of distributed control system can easily be accomplished.

SIO-R-310M uses the MSP430 microprocessor family for implementing the whole framework. Basically, it supports up to 8 inputs, and 6 relay outputs. Moreover, it equips the counter function in each input channels, and is also designed for friendly use and convenience concerns. With no doubt, SIO-R-310M will bring you the best integration in your applications.

B. Features

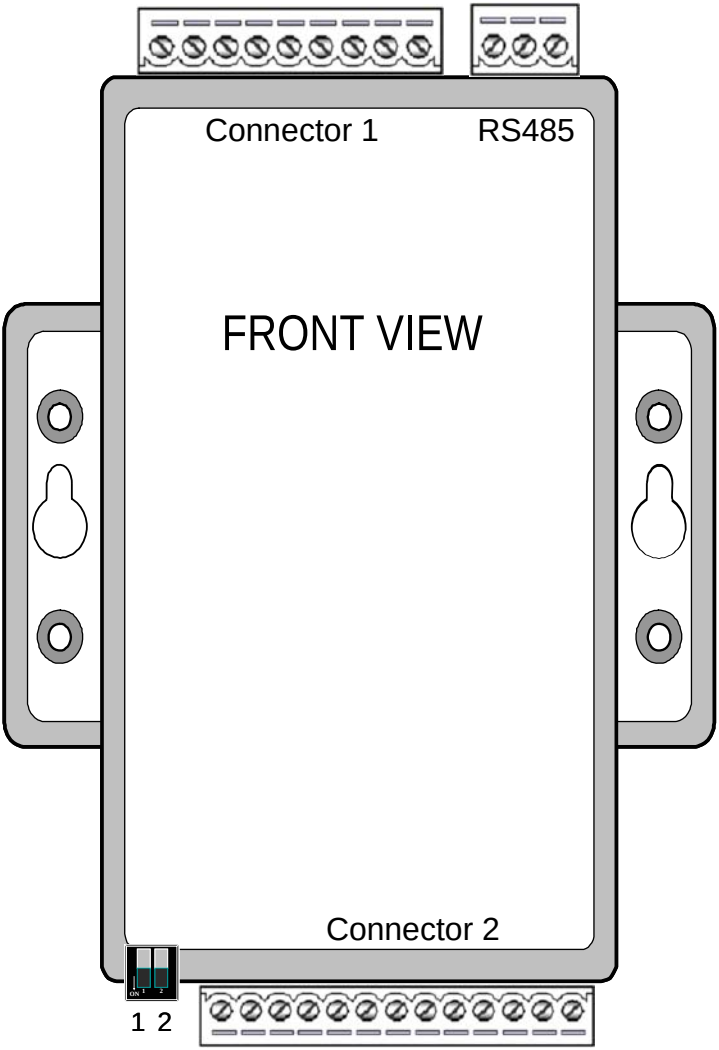
- Support ModBus Protocol
  - ✓ *Auto Detect ModBus RTU and ASCII Mode*
  - ✓ *Modbus Function Supported:*
    - *0x01: Read Coil Status*
    - *0x02: Read Input Status*
    - *0x03: Read Holding Registers*
    - *0x04: Read Input Registers*
    - *0x05: Force Single Coil*
    - *0x06: Preset Single Register*
    - *0x0F: Force Multiple Coils*
    - *0x10: Preset Multiple Registers*
- Configurable Parameters
  - ✓ *Configurable Device ID*
    - *Configure by Hardware DIP Switch*
    - *Configure by Console or ModBus (When DIP Device ID = 0)*
  - ✓ *Configurable Serial Ports*
    - *Baud Rate:* *300 ~ 115200 bps (57600 bps with counter function enabled.)*
    - *Word Length:* *7 or 8 bits*
    - *Parity Check:* *None, even or odd*
    - *Stop Bit:* *1 or 2 bits*

B. Features

- High Reliability
  - ✓ *Stable and Robust*
  - ✓ *Working 24-Hours per day*
- Insulation Input and Output
  - ✓ *DC 24V(50V Option) Photo Couple Insulation Input x 8*
  - ✓ *DC 0.5A Photo Couple Insulation Relay Output x 6*
- Digital Counter Function
  - ✓ *Use DIP Switch to enable/disable Counter Function.*
  - ✓ *Each Input will enable Counter Function simultaneously when DIP Switch select to enable Counter Function.*
- User Defined Registers
  - ✓ *User Defined Registers for Customizations x 10 (Holding Register: 40011 ~ 40020)*
  - ✓ *Frequency Registers for each input with Counter Function. (Holding Register: 40021 ~ 40030)*
  - ✓ *Counting Registers for each input with Counter Function. (Holding Register: 40031 ~ 40050)*

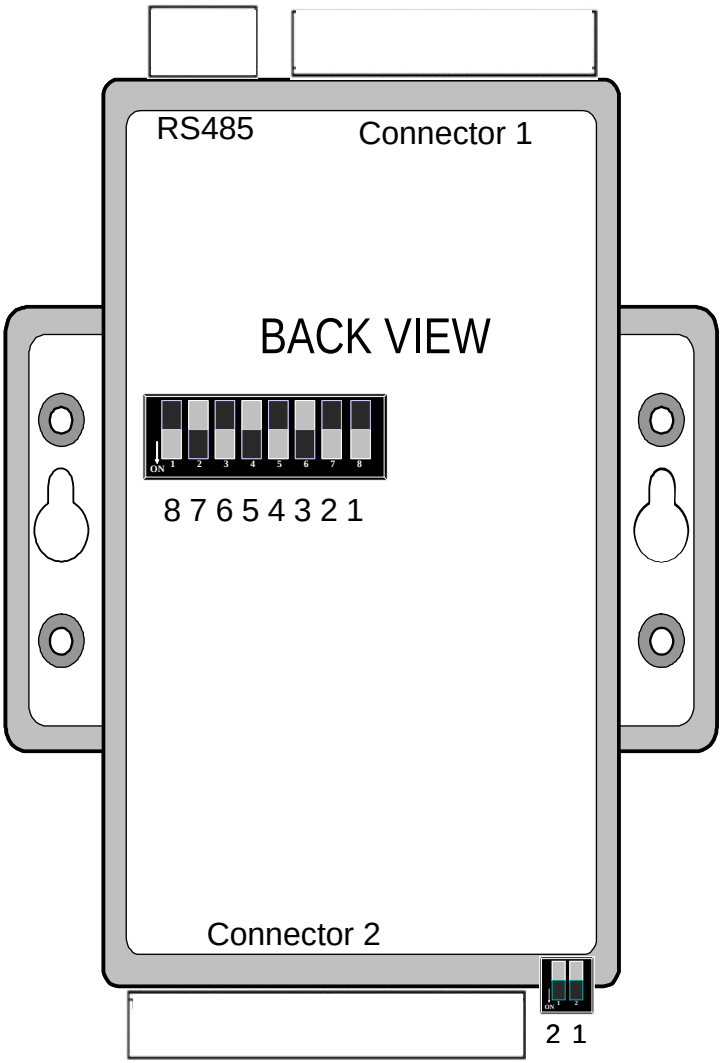
Exterior

A. Front View



Exterior

B. Back View

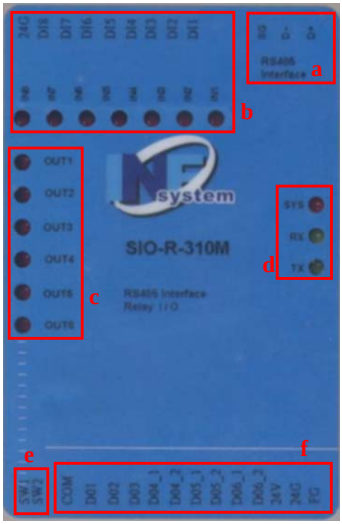


Exterior

C. Top View

Exterior

D. Front Panel



a. RS485 Port

b. CONN1 and Digital Input LED

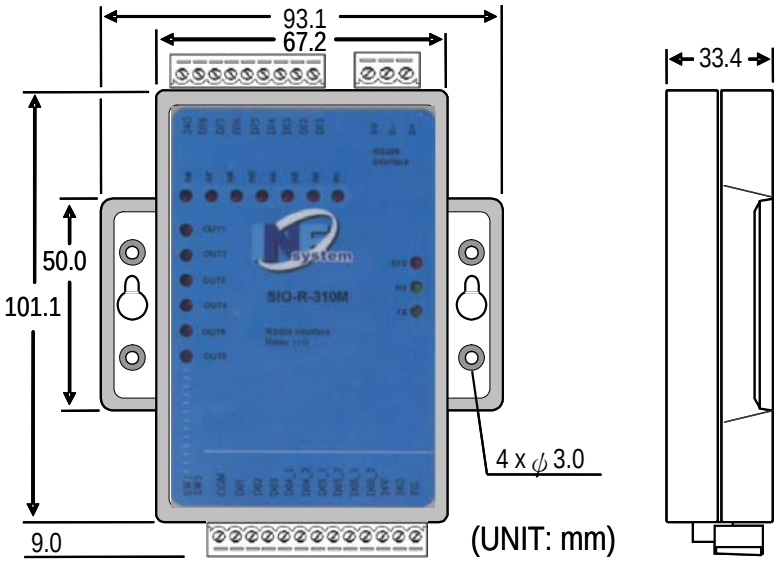
c. Digital Output LED Indicator

d. System LED Indicators

e. Function DIP Switch

f. CONN2

E. Dimension



Specification

A. Basic Specification

Entry	Description
Communication Interface	RS485
Protocol	Modbus/RTU, Modbus/ASCII
Watch Dog	Built-in hardware auto reset function
Discrete I/O	8 points, DC 24V Input (DC 50V Input Option) 6 points, DC 0.5A Output
Led Indication	SYS x1 (Red), TX x 1 (Green), RX x 1 (Green)
Power Requirement	24V DC
Power consumption	< 1W
Temperature	Operation: 0ºC~+55º C (32ºF~+131ºF)
	Storage: -20ºC~+70ºC (-4ºF~+158ºF)
Humidity	15% to 95% (non-condensing)
Dimension	100mm x 68mm x 33mm
Configuration	Through Console mode or ModBus

Specification

B. Digital Input Specification

Entry		Description
Number of Input Points		8 points
Isolated Method		Photo Couple
Rated Input Voltage		24V DC (50V DC Option)
Rated Input Current		7 mA
Operation Voltage Range		21.6V DC ~ 26.4V DC
Turn ON State		12V DC / 2 mA or higher
Turn OFF State		4V DC / 1 mA or lower
Input Impedance		Approx. 3.9 KΩ
Response Time	*OFF → ON*	8 msec or less (24 VDC)
	ON → OFF	8 msec or less (24 VDC)
Common Terminal Arrangement		10 points / common
Internal Current Consumption		MAX. 100 mA (type, all points ON)

Specification

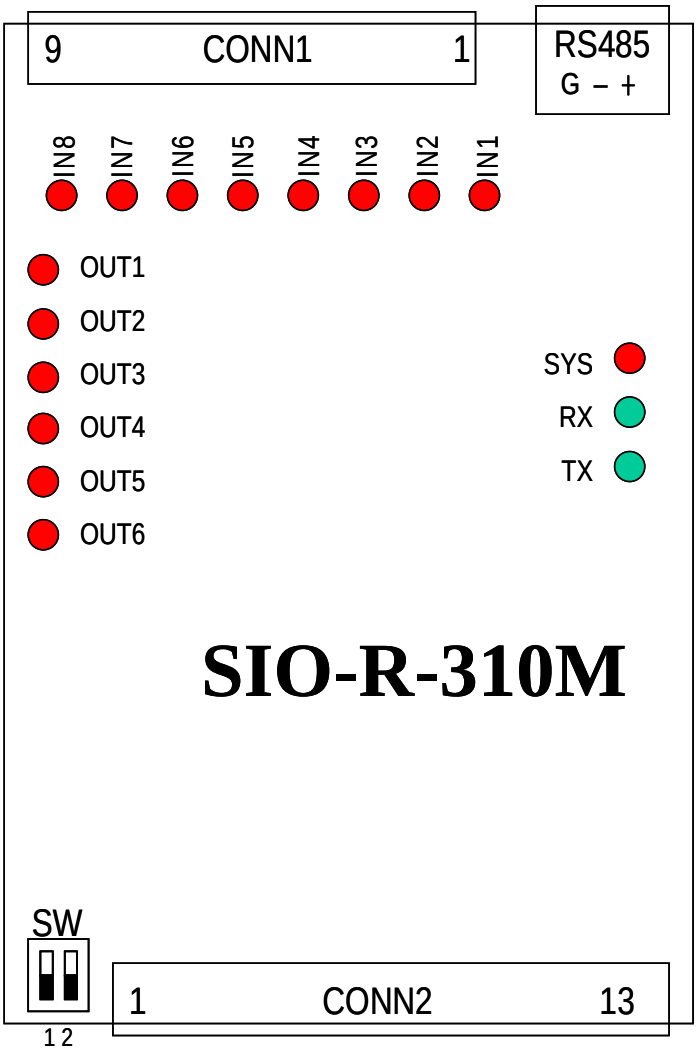
C. Relay Output Specification

Entry		Description
Number of Input Points		6 points
Insulation Method		Photo Coupler
Resistive Loading		3A/250VAC or 3A/30VDC
Inductive Loading		1/8 HP, 125VAC/250VAC
Max. switching frequency		3600 times per hour
Service Lift	*Mechanical*	More than 20 million times
	Electrical	Switching rated voltage / current more than 100,000 times
		250VAC/3A, 30VDC/3A more than 100,000 times
International current consumption		100 mA (type, all points ON)

Specification

D. LED Indicator and Switch Description

– Top View –



Specification

D. LED Indicator and Switch Description

– Led Indicator –

LED	Description
SYS	The SYS LED blinks at a rate of 2Hz at normal work. And 4Hz at Console Mode. Red Light.
RX	Blinks when receiving data.
TX	Blinks when transmitting data.
DI1 ~ DI10	Digital Input Indicator LED. ON status refers to high voltage input.
DO1 ~ DO8	Digital Output Indicator LED. ON status refers to low voltage output.

– Switch Description –

2-PIN SWITCH: For Mode Selections

PIN \ Status	ON	OFF
SW-1	Console Mode	Operation / Modbus Mode
SW-2	Enable Counter	Disable Counter

8-PIN SWITCH: For Hardware Device ID

PIN Def.	PIN 1		PIN 2		PIN 3		PIN 4		PIN 5		PIN 6		PIN 7		PIN 8	
Status Value	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
ON OFF																
Exp. Value	2^0		2^1		2^2		2^3		2^4		2^5		2^6		2^7	
Device ID = Sum of Corresponded Entry Value (Status Value x Exp. Value).																

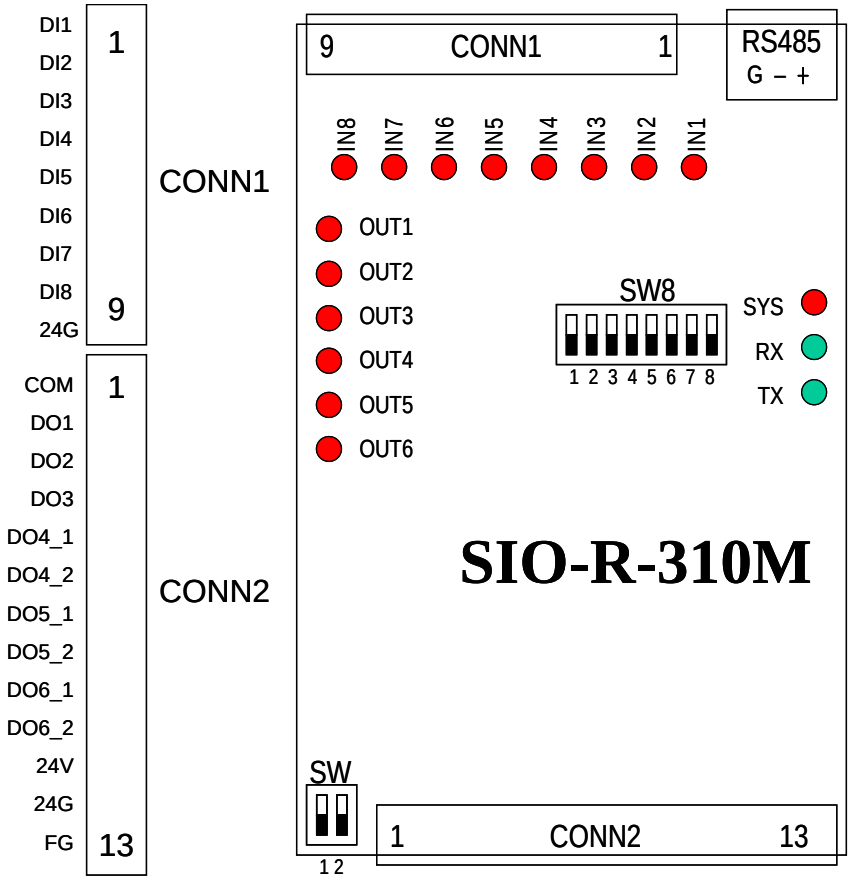
Example: PIN1, PIN2 ON, PIN3~PIN8 OFF --> Device ID = 2^0x1+2^1x1 = 3

Specification

E. PIN Definition and Wiring

Users may refer to the following diagram to connect the external wiring for the SIO-R-310M module.

– Panel PIN Definition –



Specification

E. PIN Definition and Wiring

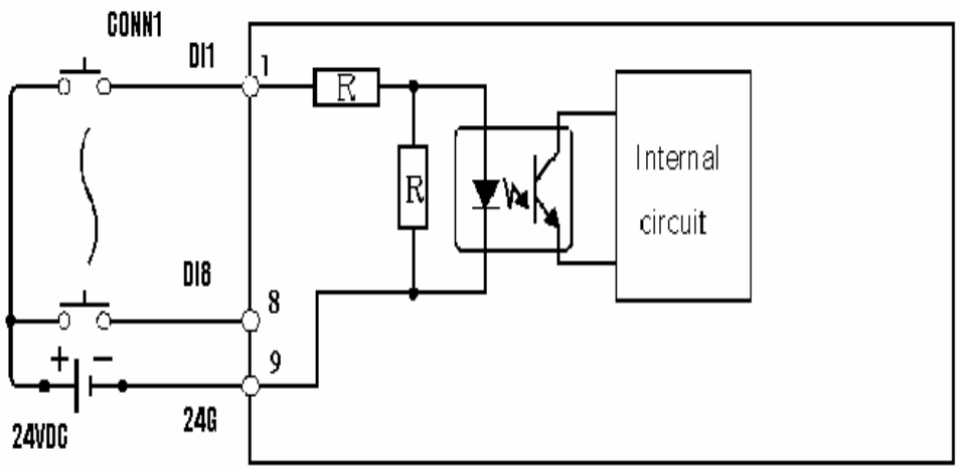
– PIN Description –

Entry	Description
CONN1 DI1 ~ DI8	Digital Input (DC 24V) Point 1~8
CONN1 GND	Use as 24V DC Ground.
CONN2 COM	Use as common ground of DO1~DO3
CONN2 DO1 ~ DO3	Common Ground Relay Output (DC 24V) x 3
CONN2 DO4 ~ DO6	Normal Open Relay Output (DC 24V) x 3
24V	Input Power of DC 24V.
24G	Ground of Input Power of DC 24V
FG	Field Ground

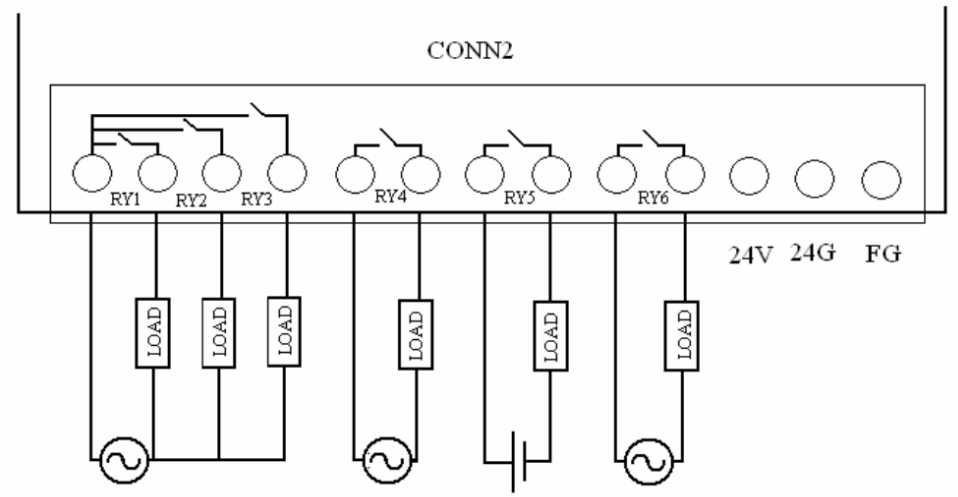
Specification

E. PIN Definition and Wiring

– Equivalent Input Circuit –



– Equivalent Output Circuit –



Specification

F. Modbus Definition

The discrete I/O points of the SIO-R-310M can easily be controlled and monitored through Modbus protocol. The Modbus address mapping with discrete I/O is described as the followings.

– Output Status Definition –

Output Status (Coil Status, ON=1, OFF=0)	
Address	Description
00001	DO1, OUT1 Status
00002	DO2, OUT2 Status
00003	DO3, OUT3 Status
00004	DO4, OUT4 Status
00005	DO5, OUT5 Status
00006	DO6, OUT6 Status

– Input Status Definition –

Output Status (Coil Status, ON=1, OFF=0)	
Address	Description
10001	DI1, IN1 Status
10002	DI2, IN2 Status
10003	DI3, IN3 Status
10004	DI4, IN4 Status
10005	DI5, IN5 Status
10006	DI6, IN6 Status
10007	DI7, IN7 Status
10008	DI8, IN8 Status

Specification

F. Modbus Definition

– Input Register Definition –

Input Registers (For Counter Function)					
Address	Definition	Address	Definition	Address	Definition
30001	DI1 Pulse Frequency	30011	DI1 Count Low Byte	30021	DI6 Count Low Byte
30002	DI2 Pulse Frequency	30012	DI1 Count High Byte	30022	DI6 Count High Byte
30003	DI3 Pulse Frequency	30013	DI2 Count Low Byte	30023	DI7 Count Low Byte
30004	DI4 Pulse Frequency	30014	DI2 Count High Byte	30024	DI7 Count High Byte
30005	DI5 Pulse Freq.	30015	DI3 Count Low Byte	30025	DI8 Count Low Byte
30006	DI6 Pulse Frequency	30016	DI3 Count High Byte	30026	DI8 Count High Byte
30007	DI7 Pulse Frequency	30017	DI4 Count Low Byte	30027	Reserved
30008	DI8 Pulse Frequency	30018	DI4 Count High Byte	30028	Reserved
30009	Reserved	30019	DI5 Count Low Byte	30029	Reserved
30010	Reserved	30020	DI5 Count High Byte	30030	Reserved

Specification

F. Modbus Definition

– Holding Register Definition –

Holding Register Definition			
Address	Definition	Address	Definition
40001	Output Register	40026	DI6 Input Frequency
40002	Input Register	40027	DI7 Input Frequency
40003	Device ID	40028	DI8 Input Frequency
40004	Baud Rate	40029	Reserved
40005	Word Length	40030	Reserved
40006	Parity Check	40031	DI1 Count (Low Byte)
40007	Stop Bit	40032	DI1 Count (High Byte)
40008	Write Data Command	40033	DI2 Count (Low Byte)
40009	Write Data Status	40034	DI2 Count (High Byte)
40010	RS485 Change on-line	40035	DI3 Count (Low Byte)
40011	User Defined Register	40036	DI3 Count (High Byte)
40012	User Defined Register	40037	DI4 Count (Low Byte)
40013	User Defined Register	40038	DI4 Count (High Byte)
40014	User Defined Register	40039	DI5 Count (Low Byte)
40015	User Defined Register	40040	DI5 Count (High Byte)
40016	User Defined Register	40041	DI6 Count (Low Byte)
40017	User Defined Register	40042	DI6 Count (High Byte)
40018	User Defined Register	40043	DI7 Count (Low Byte)
40019	User Defined Register	40044	DI7 Count (High Byte)
40020	User Defined Register	40045	DI8 Count (Low Byte)
40021	DI1 Input Frequency	40046	DI8 Count (High Byte)
40022	DI2 Input Frequency	40047	Reserved
40023	DI3 Input Frequency	40048	Reserved
40024	DI4 Input Frequency	40049	Reserved
40025	DI5 Input Frequency	40050	Reserved

Specification

G. Modbus Definition Description

Addr.	Att.	Functions	Description	Note
00001 ~ 00006	R/W	0x01 Read Coil Status 0x05 Force Single Coil 0x0F Force Multiple Coil	DO1 ~ DO6 ON / OFF Status and Control	ON=1, OFF=0 No of Point <= 6
10001 ~ 10008	Read Only	0x02 Read Input Status	DI1 ~ DI10 High / Low Status	High=1, Low=0 No of Point <= 8
30001 ~ 30010	Read Only	0x04 Read Input Registers	Detect the Frequency of Input Pulse (30009, 30010 Reserved)	Frequency Upper Bound at 250 Hz.
30011 ~ 30030	Read Only	0x04 Read Input Registers	Counter Value for DI Odd Address (Low Byte) Even Address (High Byte)	Count for 32 bit (30027~30030 Reserved)
40001	R/W	0x03 Read Holding Registers 0x06 Preset Single Register 0x10 Preset Multiple Registers	DO1 ~ DO6 ON / OFF Status and Control In Bit Level	ON=1, OFF=0 BIT0=DO1,...BIT8=DO8
40002	Read Only	0x03 Read Holding Registers	DI1 ~ DI10 High / Low Status In Bit Level	ON=1, OFF=0 BIT0=DI1,...BIT10=DO10

Specification

G. Modbus Definition Description

Addr.	Att.	Functions	Description	Note
40003	R/W	0x03 Read Holding Registers 0x06 Preset Single Register 0x10 Preset Multiple Registers	Enable while: Hardware Device ID = 0	0 < Device ID < 256
40004	R/W		RS485 Baud Rate x 100	Accept: 3, 12, 24, 48, 96, 192, 384, 576, 1152
40005	R/W		RS485 Word Length	Accept: 8, 7 (8bit and 7bit)
40006	R/W		RS485 Parity Check	Accept: 0, 1, 2 0: None, 1: Odd 2: Even
40007	R/W		RS485 Stop Bit	Accept: 1, 2 1: 1 stop bit 2: 2 stop bits
40008	R/W		0xAAAA: Save Device ID and RS485 Configuration Setting. 0xBBBB: Save User Defined Registers 0xCCCC: Save DI Counter Registers 0xFFFF: Restore the Default Value(40009=0)	Accept: 0xAAAA, 0xBBBB, 0xCCCC 0xFFFF
40009	Read Only	0x03 Read Holding Registers	Show Status of 40008	Display: 0x0000, 0xAAAA, 0xBBBB, and 0xCCCC
40010	R/W	0x03 Read Holding Registers 0x06 Preset Single Register 0x10 Preset Multiple Registers	Change RS485 Setting right away when 0xFFFF	
40011 ~ 40020	R/W		User Defined Registers	For Customization
40021 ~ 40030	Read Only	0x03 Read Holding Registers	Detect Input Pulse Freq. (40029, 40030 Reserved)	Upper Bound at 250 Hz
40031 ~ 40050	R/W	0x03 Read Holding Registers 0x06 Preset Single Register 0x10 Preset Multiple Registers	Counter Value for DI Odd Address (Low Byte) Even Address (High Byte)	Count for 32 bit (30027~30030 Reserved)

Configuration

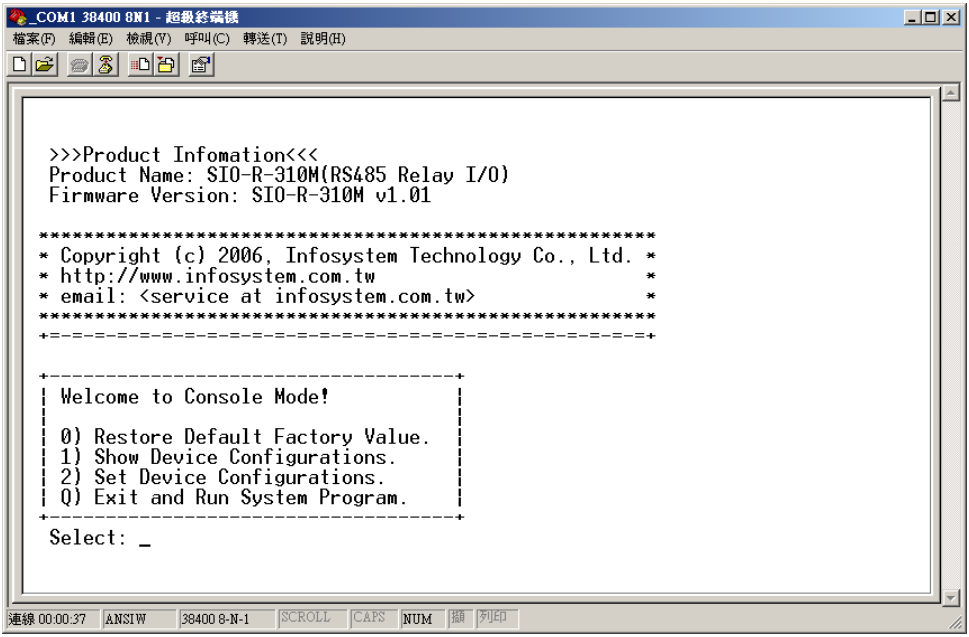
A. Console Mode Description

– HyperTerminal Connection Screen Shot –

Note:

Console Mode is statically configured as 38400, 8, N, 1, and Flow Control is none.

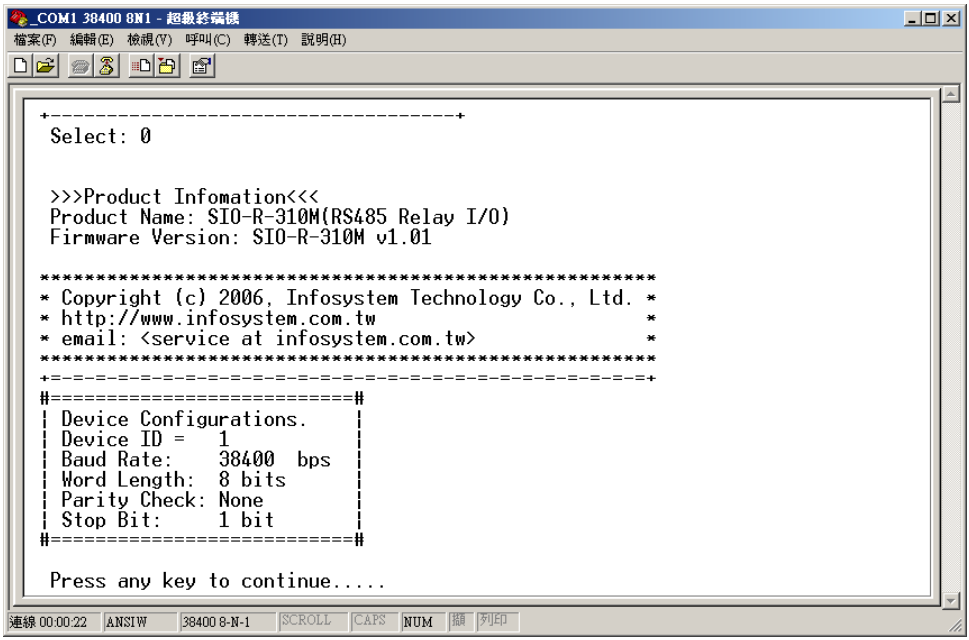
The Connection of HyperTerminal is as the following:



[Figure. Main Menu]

Configuration

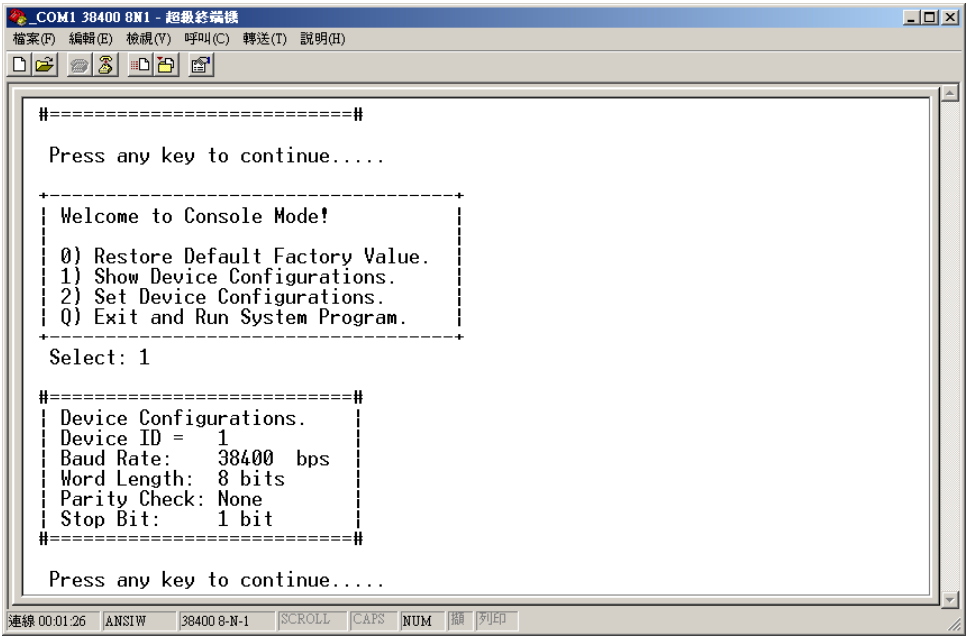
– HyperTerminal Connection Screen Shot –



[Figure. Restore Default Factory Value.]

Configuration

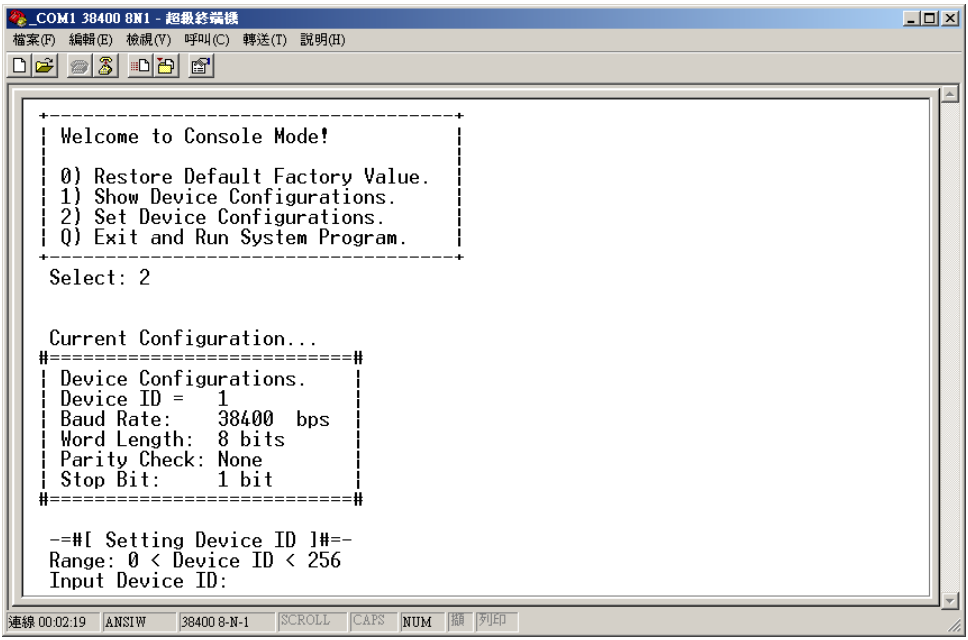
– HyperTerminal Connection Screen Shot –



[Figure. Show Device Configuration.]

Configuration

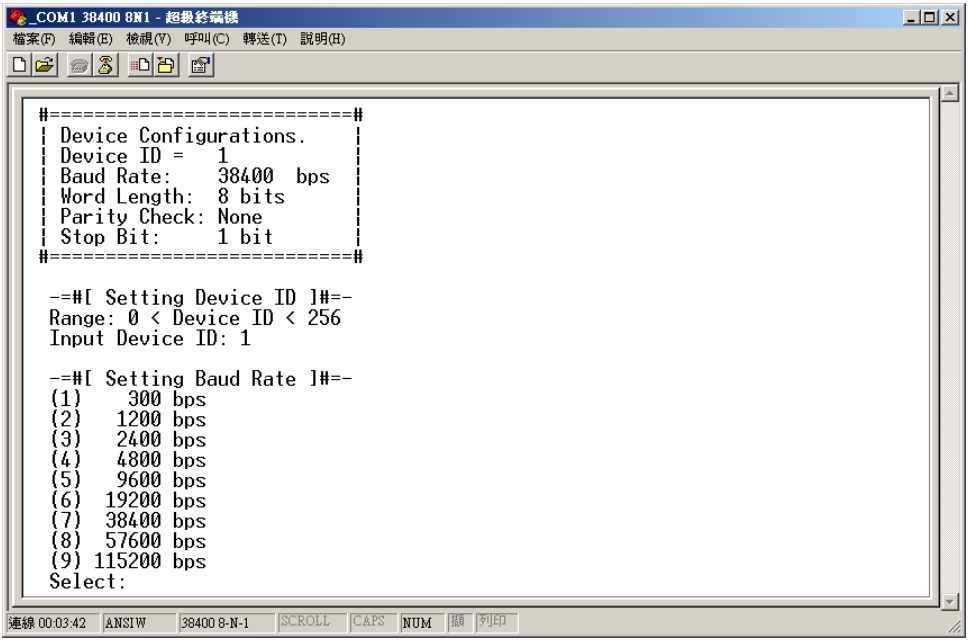
– HyperTerminal Connection Screen Shot –



[Figure. Set Device Configurations.]

Configuration

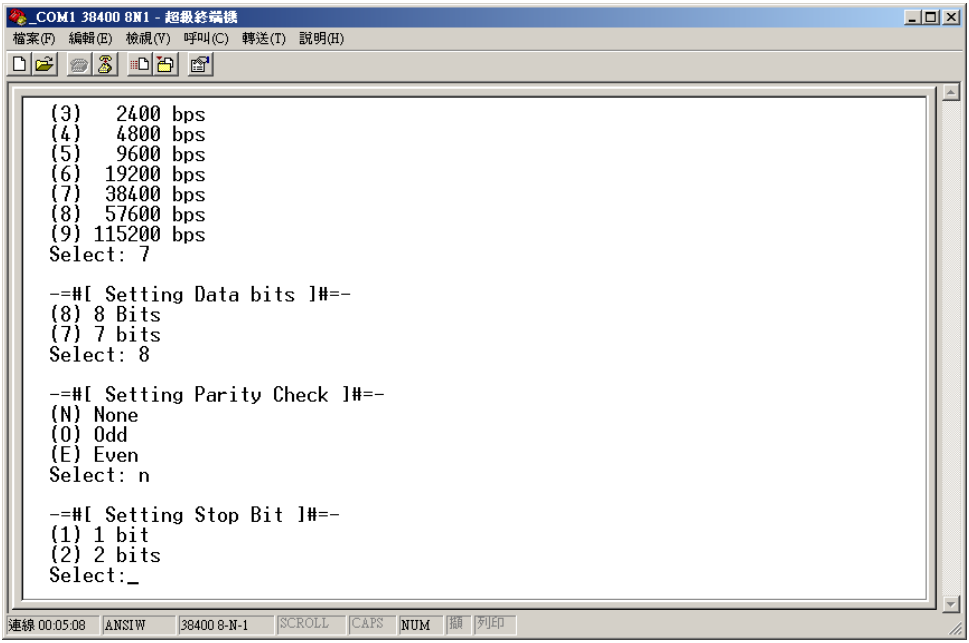
– HyperTerminal Connection Screen Shot –



[Figure. Set Input Device ID]

Configuration

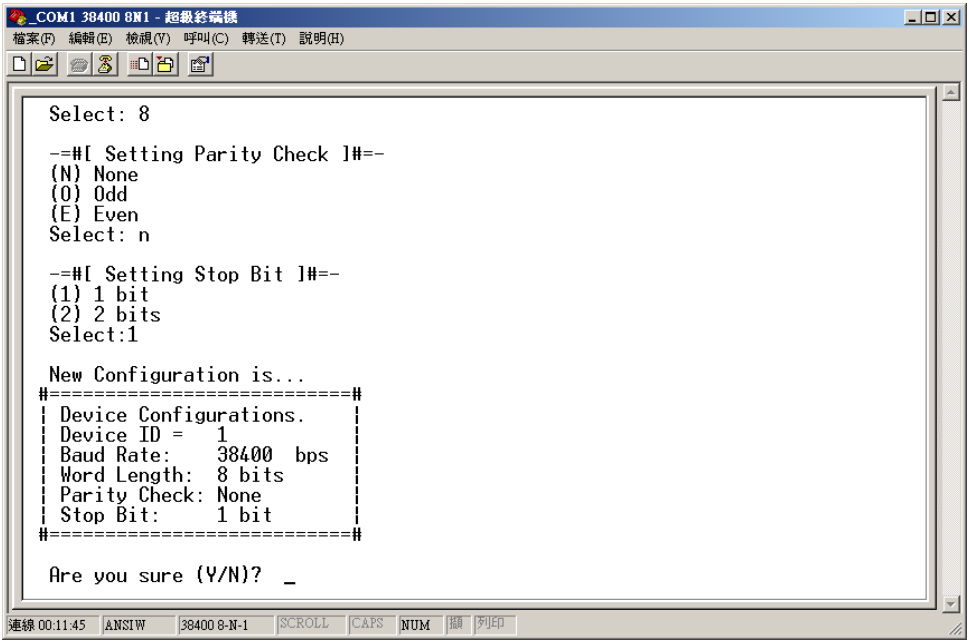
– HyperTerminal Connection Screen Shot –



[Figure. Setting Data bits, Parity Check and Stop Bit]

Configuration

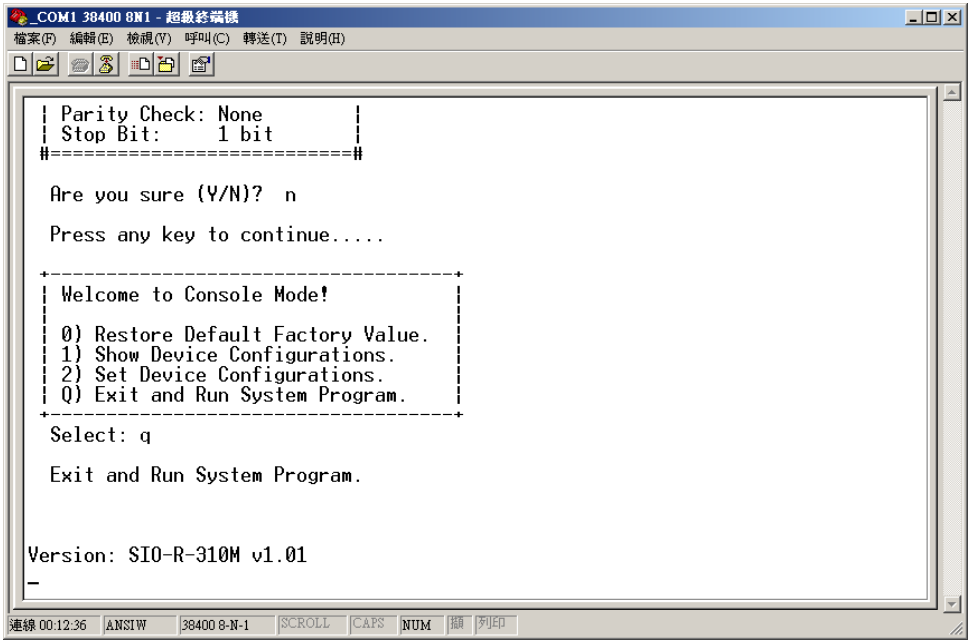
– HyperTerminal Connection Screen Shot –



[Figure. Make sure to save the Configurations.]

Configuration

– HyperTerminal Connection Screen Shot –


_COM1 38400 8N1 - 超級終端機
檔案(F) 編輯(E) 檢視(V) 呼叫(C) 轉送(T) 說明(H)
| Parity Check: None |
| Stop Bit: 1 bit |
#==========#
Are you sure (Y/N)? n
Press any key to continue.....
+----------+
| Welcome to Console Mode! |
| 0) Restore Default Factory Value. |
| 1) Show Device Configurations. |
| 2) Set Device Configurations. |
| Q) Exit and Run System Program. |
+----------+
Select: q
Exit and Run System Program.
Version: SIO-R-310M v1.01
連線 00:12:36 ANSIW 38400 8-N-1 SCROLL CAPS NUM 擷 列印

[Figure. Exit and Run System Program.]

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